SYSTEM FOR CONTROLLING ACCESS AND DISTRIBUTION OF DIGITAL PROPERTY

This is a division of application Ser. No. 08/968,887, filed Nov. 5, 1997 which is a continuation of Ser. No. 08/584,493, filed Jan. 11, 1996, now abandoned.

1. FIELD OF THE INVENTION

This invention relates to the control of distribution and access of digital property as well as to the payment therefor.

2. BACKGROUND OF THE INVENTION

The development and deployment of digital information networks is accompanied by new concerns for the protection of rights to data and information. The U.S. Congress Office of Technology Assessment identified the following key developments relevant to the area of this invention: there has been an overall movement to distributed computing; boundaries between types of information are blurring; the number and variety of service providers has increased. *Information Security and Privacy in Networked Environments*, Congress, Office of Technology Assessment, OTA-TCT-606, Washington, DC: U.S. Government Printing Office, September 1994.

Computer networks allow more interactivity; and, most significantly, electronic information has opened new questions about copyright, ownership, and responsibility for information. Technology, business practice, and law are changing at different rates, law arguably being the slowest.

Intellectual property, or information, is different from real property. A major difference between intellectual property and real property is that intellectual property can be embodied in forms which can be copied from the owner while the owner still retains the original. For example, a broadcast or performance of a musical composition can be recorded (and copies made of the recording) while the composer retains the original composition; a photograph can be reproduced while the owner retains the original negative.

In the past, when information was stored in analog form, the copying and redistribution of such information, while problematic, did not account for as much economic loss as is possible today. The storage of information in analog form uses a physical medium that is made to have some characteristic vary in proportion with the information to be stored. For instance, the groove on a vinyl record captures the frequency and intensity (volume) of a sound by the extent of its excursion. At each stage in the process of playing a record: the stylus tracing the groove, generation of a small voltage, amplification of the voltage, and reproduction of the sound, small errors are introduced. Today's high fidelity systems are very accurate, but they are not flawless.

Indeed, copying a vinyl record to a cassette tape results in a small, but noticeable, reduction in sound quality. If multiple generations of recording (e.g., cascaded recordings) were undertaken, the resulting product would be noticeably inferior to the original. Similarly, when multiple generations of photocopies of an image are made, the quality of the resulting image is typically poor, with many dark and light areas that were not present in the original image.

It is the inevitable gradual degradation of quality that has proven to be a practical disincentive to large scale copying of analog information. Notwithstanding this observation, where the potential profits are high, such copying is undertaken even though the resulting product's quality is significantly below that of the original. Videotape copies of movies

represent a good example. Some fraction of the marketplace is willing to accept a lower quality product in exchange for a significantly lower price. The logistics associated with making large numbers of copies (an inherently serial process), including obtaining the raw materials (cassettes), the reproduction equipment, and the distribution channels also have served to limit illicit production. Finally, the quality of the product as well as the markings on the package distinguish it from the original and may also serve as a disincentive (for some) to purchase an illicit copy.

Just as the invention of the printing press changed the way in which society interacted with information on paper, the technical advances in digital computers and communications in the closing years of the twentieth century have a potential for high impact on legal, moral, and business practice. The printing press is often credited as an enabling mechanism for the Renaissance and the Reformation in Europe. The advances in digital information technology will similarly impact commerce and law. Digital technology enables changing the representation of information without changing the content. (Of course the content can be changed too.)

The storage of information in digital form depends on the ability to encode information in binary form to arbitrary precision and to record that binary form in a physical medium that can take on two distinct characteristics. Preserving the fidelity of information recorded in binary (using media with two distinct and easily-differentiated characteristics) is easily accomplished. For instance, a compact disc stores information (each binary digit or bit) as the presence or absence of a hole (depression or pit) that reflects or does not reflect light. Compared to the analog recording of phonograph records, the information stored in each hole is unambiguously a binary digit, the value of which is either zero or one. No other values are possible. A digital tape stores each bit as a magnetic spot that is oriented either north/south or south/north. Today's digital sound systems use sufficiently many bits to capture sound levels beyond the ability of the human ear to distinguish a difference and in so doing attain so-called "perfect" fidelity.

A digital file can be copied with no loss of fidelity (as the mechanism need only distinguish between two easily-differentiated states). With straightforward and well-known error-correction mechanisms, even inevitable flaws can be made so improbable as to occur fewer than once in ten billion bits.

As a result of the ability to copy a file with no loss of fidelity, it is now almost impossible to differentiate a digital copy from the digital original. In a network environment recording materials, reproduction equipment and distribution are not impediments to copying. Consequently, in the digital domain the threshold inhibiting the making of illicit copies is significantly lowered. Evidence that this is the case is presented by the Software Publishers Association and by the Business Software Alliance, each of which indicates that billions of dollars of software is pirated (in the sense of being illicitly copied) each year. Additionally, print publishers hesitate to expand into the network marketplace because they are unable to control (in the sense of receiving compensation in return for rights) secondary distribution of their products as well as incorporation of their products into derivative products. Digitally stored information may include binary data, computer software, text, graphics, audio, and video. The uses of this information include news, entertainment, education, and analysis. Information may be distributed in many ways, including networks, magnetic media, CD-ROM, semiconductor memory modules, and wireless broadcast.